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Supply Chain Risk Management in Shrimp Industry Before and During Mud Volcano Disaster: An Initial Concept

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Abstract

The aim of this paper is to analyse the function of supply chain risk management in supporting shrimp industry before and during mud volcano disaster in Sidoarjo (Indonesia). Articles related to supply chain risk management are identified and analysed. Theories and concepts are outlined in order to develop a supply chain risk management. Future research may explore the model with a qualitative research to identify and analyse the application of supply chain risk management in shrimp industry. Supply chain risk management can help this sector to sustain their business. There has been little investigation in shrimp industry so that further study in this sector is needed. This study can be used by academicians and professionals who wish to address supply chain risk management practice in shrimp supply chain. Investigating the role of supply chain risk management in shrimp sector will enable the farmer, small traders, manager in depots and processing plants to prevent risks to their business. This paper recognizes that supply chain risk management requires further study in different method and sectors to enrich the understanding of key constructs.

Keywords: shrimp industry; supply chain risk management; mud volcano disaster

1. Introduction

Shrimp is a highly valued commodity traded worldwide (FAO, 2010). Indonesia is one of shrimp exporters and the main destination market includes Japan, USA, and EU for specific type of shrimp. The shrimp industry also provides vacancy for local people such as, fry collectors, hatchery operators, shrimp farmers, traders, and processors. In other words, the shrimp industry has positive impact on social and economic. For example, there were approximately 13,978 workers involved in the shrimp industry in Sidoarjo, East Java (DKP Sidoarjo, 2010; Marines and fisheries in figures 2011). However, this industry could only produce shrimp which valued for roughly US$ 4,877,870 in 2010 since the natural disaster occurred in 2006. In fact, the production of shrimp in 2008 dropped 18.6% (DKP Sidoarjo, 2009). According to Antara (2009), there were 200 farmers had been affected by the dumping of mud volcano to

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the river in Porong (district of Sidoarjo). In fact, the dumping can affect the vegetation and aquaculture because the mud contain several hazardous materials, such as, Hydrocarbon Sulphide, Mercury, Cadmium, Chromium, Arsenic, and Phenol (Antara, 2006;Mawardi, 2006;Herawati, 2007;Pohl, 2007;McMichael, 2009). In addition to this, the ICBB claimed that the mud volcano in Porong contains dangerous bacteria, such as, *coliform*, *salmonella*, and *staphylococcus aureus* (Antara, 2006). In short, the mud volcano has significant impact on the shrimp production in Sidoarjo since the Mud Volcano disaster occurred.

As the shrimp industry has been existed, this sector needs to be aware of any potential risks, such as, supply risk, demand risk, and environmental risk which could impact their sustainability. Some studies found that if supply chain risk is managed correctly, the profit of the organization will be significantly affected (Cousins et al., 2004; Hendricks and Singhal, 2005). In other words, the shrimp industry should properly manage their supply chain in order to improve their performance, even though their supply chain processes are more complex. Therefore, this objective might not be achieved if shrimp industry has not implemented proper supply chain risk management.

Johnson (2001) argues that supply and demand risks are the source of risks in supply chain. The present researcher argues that supply risks include limited capacity, currency fluctuation and supply disruption. Meanwhile, demand risks include seasonal imbalance, volatility of fads and new products. However, Juttner et al.(2003) contend that risk can be categorized into three classifications, such as, external, internal and network related. The present researchers posit that the source of risks from external of supply chain could be affected by political, natural disaster, social and market. Furthermore, the source of internal risk might come from strikes, machine failure and IT uncertainties (Juttner et al., 2003). Then, the present researchers claim that the network related risk could be occurred when the interaction between organization within supply chain become failure. For example, the relationship between buyer and supplier can be disrupted by false information flow from the buyer side and poor quality product and service from supplier side. In short, the point of view of researchers regarding to risk in supply chain are varying so that the categorization of risk might also be different in other sectors.

Most of researchers are focusing their research on supply chain risk management in certain sectors, for instance, electronic, manufacturing, and automotive. In fact, the research in supply chain risk management in shrimp industry has been rare. For this reason, research in shrimp industry may add to the existing knowledge on how the applications of supply chain risk management before and during the natural disaster. In addition to this, this research intends to fill the gap in literature with the aim to provide guidelines for managers in shrimp industry in different regions or countries on how to deal with risk. This conceptual research propose to investigate in how natural disaster impact the application of supply chain risk management in shrimp industry and what type approaches they applied before and during natural disaster.

This research will focus investigations on Indonesia's shrimp industry in Sidoarjo for several reasons. First, Sidoarjo District play significant role in fishery export. There are eight sub districts provide land for fishery ponds as it can be seen on the table 1. Second, the Mud Volcano disaster is occurring in Sidoarjo and this disaster has been demolished infrastructures, houses, and industries. Also, there are approximately 600 hectares of land and housing has been buried by the Mud Volcano. Third, the shrimp industry in Sidoarjo has been employed more local people so that the sustainability of this industry has huge significances to the local people economy. Fourth, the shrimp industry in Sidoarjo is significantly contributed to the Indonesian fishery export.

Table 1: The fisheries ponds in Sidoarjo, West Java Province, Indonesia

Sub district	Land used(ha)
Waru	402
Sedati	4,100
Buduran	731
Sidoarjo	3,128
Tanggulangin	497
Candi	1,032
Porong	496
Jabon	4,144

Source: Sidoarjo Fisheries and Marine Department, 2009.

Extant research examines the role of supply chain risk management on manufacturing but has not focused on shrimp industry. In fact, there is no existing study investigate the implementation of supply chain risk management before and during Mud Volcano disaster. The research questions for this study are:

- How has the shrimp industry managed their supply chain risk before and during the mud volcano disaster?
- What are the impacts of supply chain risk management on the shrimp industry?

2. Theoretical background and research framework

2.1 The concept of risk

It is important to address at the beginning about several definitions of risk. According to Simon et al. (1997), risk can be outlined as any uncontrolled event that will create a potential loss to achieve the goal. In respect to supply chain, Tang and Musa (2011) reveal that the definition of risk is any defective and indeterminate resources in which can interrupt supply chain. With regards to uncertainty, the present researchers claim that many researchers are difficult to divide between these two terms. They posit that uncertainty is related to how to manage supply chain process properly so that supply and demand could be matched. However, Slack and Lewis (2001) contend that uncertainty is antecedent of risk. Thus, conducting several actions, such as, prevention, mitigation, and recovery, can help to measure and change the uncertainty. However, they contend that the actions are taken by decision maker might be difficult to eliminate the risk but the actions could be applied to reduce the risk from uncertainty. In this case, Yates and Stone (1992) suggest that risk might not occur if decision maker successfully encounter the outcomes. In short, it can be seen that there are vary interpretations of risk as well as uncertainty among researchers.

Tang and Musa (2011) argue that risk has two dimensions include in the definition of risk, such as, the consequence and prospect of risk causes. The present researchers conclude that most of the scholars have similar interpretation to risk causes. Most of them claim that risk can harm organization. But, the last dimension is demanding to describe. Therefore, they posit that definition of risk should be related to small probability events that could disrupt the systems. In other words, risk might occur in many forms in the future whether loss or gain (Moore, 1983). For this reason, some researchers outline that one supplier might have positive impact on organization as long as long-term relationship is developed (Khan and

Burnes, 2007). However, the risk might significantly harmful if any entities try to obtain more advantageous from other entities (Cousin et al., 2004). Therefore, decision maker needs to prepare several actions and precise assumptions of the risk outcome. In short, having good understanding about dimensions in risk can lead to create proper decision.

2.2 The context of supply chain risk management

Currently, supply chain management function is concerned in business practice. Thus, business organization needs to plan how they must to deal with the potential risk in supply chain. Some studies found that if supply chain risk could not be managed properly, the profit of business organization will be affected significantly (Cousins et al, 2004; Hendricks and Singhal, 2005). Furthermore, Cousins et al. (2004) argue that the business organization could have additional impact of failure to manage the risk in supply chain. The impact might relate to decrease in quality of product, assets and tools destruction, forfeiture, and delivery delays. In respect to this, Hendricks and Singhal identify that potential conflict between stakeholders might occur. Therefore, Lewis (2003) argues that business organization needs to understand the benefit as well as how to manage the risk. To be more precise, scholars are expected to develop the framework of supply chain risk in order to help decision making process in management practices. It is presumed that there is a high expectation of knowledge recently in risk related to supply chain.

Furthermore, supply chain risk management plays an important role to decrease unexpected deviations in terms of the consistency of goal, quality control and process self-control (Moore, 2002). The recent studies in supply chain risk management tend to investigate far from system analysis and decision making (Tang and Musa, 2011). Therefore, they suggest that future research need to contribute to support those fields. In respect to this, Giunipero and Eltantawy (2004) outline that SCRM include three processes, such as, recognize possible, considerate, and transfer the probability of negative outcome. However, Christopher (2002) contends that SCRM can be applied to control the entities in supply chain from vulnerability. In support of Christopher's ideas, Tang (2006) also argue that despite control the chain, collaboration in SCRM can also be used to reduce risks. The present researcher further argues that managing supply chain is also critical to ensure profitability and continuity in industrial practice. This means that all entities in the chain should be integrated with the aim to sustain the performance as well as to reduce the impact of risk. To sum up, the future research should apply appropriate risk approaches which can help decision maker to manage the risk.

As the risk might affect the performance of supply chain in shrimp sector, appropriate approaches to manage the risk are important. Juttner et al., (2003) posit that SCRM is comprised by four aspects, for example, recognize the source of risk, address the possibility of any consequences, outline the drivers of risk, and risk mitigation. These steps will help the manager to produce appropriate decision making in order to protect the business from losses. However, Ritchie and Brindley (2007) contend that SCRM is can be used as a strategy to measure the risk performance. In regards to this, they posit that when the risk source and profile have been identified, the following steps should be taken. The steps include analyzing the performance of risk driver, consequences, responses, and outcome. They argue that risk in the chain can be encountered as long as the decision maker prepares proper approaches. But, despite measuring the risk performance, monitoring is also important to be done. In other words, the framework of previous scholars do not specify monitoring process in which can help the manager to control the potential risk.

2.4 Research framework

Previous researches in supply chain risk management (SCRM) have lack empirical validation and are rarely investigated in shrimp industry. This study is focused on shrimp industry with the aim to find out the application of supply chain risk management before and during the mud volcano disaster. This study

will follow the stages in supply chain risk management. The stages of risk identification, measurement, assessment, evaluation, mitigation, contingency plan, control, and monitoring are affected by the mud volcano disaster. As the processes in supply chain risk management are uninterrupted, the initial stage will be started when the monitoring has been reached. The research model is depicted in figure 1.

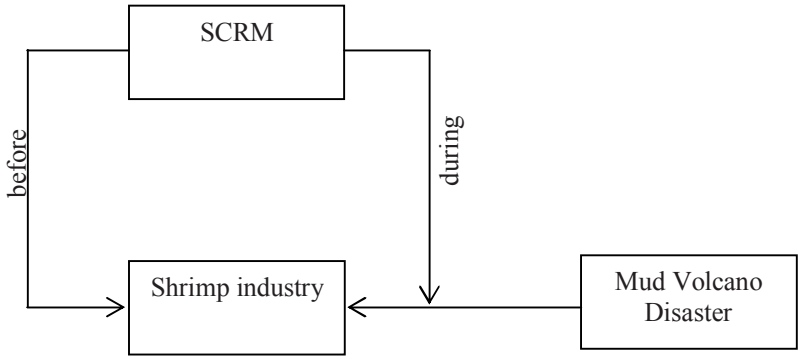

Fig.1 Research framework

3. Future research

3.1 Research methodologies

Exploratory will be taken in this study with the aim to understand the supply chain risk management practice in shrimp industry. This research will be conducted based on case studies with the aim to collect detail information. Also, it is convenient for the respondent to answer how and why questions (Yin, 2011). The case study approach is chosen because of several reasons as follows.

- This case study is a proper method to explore supply chain risk management practice in shrimp industry before and during mud volcano disaster.
- This case study will help the researchers to gain valid data related to service supply chain risk management practices which may be too complex for surveys (Yin, 2011).
- This case study also provides an opportunity for interviewer to gain lot of experience in regards to personal communication (Blome and Schoenherr, 2011).

3.2 Case selection

The entities in shrimp industry are purposefully selected because the complexity of supply chain they have based on the nature of supply chain risk management practice. Each entity will be nominated as the unit of analysis. The following entities will be selected: farmers, small traders, depot, processing plant, and distribution channels. These entities will also be selected as case studies. The reason for this is that researchers are able to ensure the saturation of theory. These case studies provide range of perspectives as well as demonstrating best practices in shrimp supply chain.

3.3 Data collection

The interview will be conducted data collection in the site of entities case study. Researcher will be equipped with detailed notes. Additional documents will be used for triangulation after interviews. A case study protocol will be added as well as a semi structured interviews. This will guide the researcher to

ensure their consistency during interview through the entities. Relevant information and supplementary material will be storage and structured in NVivo after a case study protocol has been developed. Therefore, information from the case studies related to their annual reports and other data will be included (Gibbert et al., 2008).

3.4 Data analysis

Collected data was analyzed based on key categories. Therefore, researchers utilized several key categories, such as, risk identification, measurement, assessment, evaluation, mitigation, contingency plan, control, and monitoring. All of the cases will be mutually examined and coded to confirm reliability in order to reduce discrepancy (Blome and Schoenherr, 2011). The cross-case analysis will be utilized to detect communalities and differences related to supply chain risk management practice (Eisenhardt and Graebner, 2007).

4. SCRM in shrimp industry

Supply chain risk can be categorized into several classifications include: process, control, demand, supply and environmental (Christopher and Peck, 2004). Then, the present researchers divide the risks into three groups. The first is called internal risks that include process and control. The second is related to demand and supply risks. The third is categorized as external risk that includes environmental risks. In this case, they posit that despite supply chain risks, there are internal and external risks that could impact the supply chain. However, Zsidsin et al. (2005) argue that the key dimensions of supply chain risk have been less investigated. Therefore, study in different industry especially in shrimp industry will enrich the understanding of risk related to supply chain risk management. Overall, the above discussion shows the different perspectives of risk categories among the scholars in supply chain. Most of researchers identified the risk based on manufacturing sector or risk in general perspectives.

In the context of supply chain in shrimp industry, the primary source of risk may be derived from specific processes in the chain. For example, the shrimp farmer ignores to keep the harvested process clean when the shrimp is harvested. In addition to this, the transportation process has not been put the attention on the cleanness as well as unrefrigerated truck. As a result, those processes can impact on the quality of the shrimp. In this case, supply chain risk management is required to coordinate the activities of supply chain members to reduce supply chain vulnerability as a whole, increasing cost-effectiveness and stability (Christopher, 2002; Tang, 2006).

Tummala and Schoenherr (2011) propose their new framework of supply chain risk management process after successfully applied in other sector. Their framework includes three phases. Phase I consist of risk identification, measurement, and assessment. Phase II comprise evaluating, mitigation the risk as well as contingency plan. Phase III involve controlling and monitoring the risk. The advantageous of this structure is that manager will easy to integrate the drivers and categories of risk. Also, evaluation and performance are integrated into the structure before decision making. However, they imply that this framework needs to be tested in different sector in different countries with the purpose of generalizability whether this framework is fit with the range of company in different culture. In addition to this, Tang and Musa (2011) suggest that risk management in supply chain is a critical issue to study because the outcome of research can develop the performance of business. Therefore, supply chain risk management practice need to investigate further in different sector. In this case, the investigation of supply chain risk management in shrimp industry will contribute to the existing knowledge as well as practical implication.

Supply chain in shrimp industry in Sidoarjo involves many entities, such as, farmers, small traders, depot, processing plant, and distribution channels. The complexity in shrimp supply chain may impact this sector to sustain in business. The mud volcano has impacted the quality of the environment surrounding the industry so that the quality of their product can also be affected. According to Alam and Pokrant (2009), their study found that quality issue in terms of operational, transportation, depot, and

processing plant affected the EU ban on the Bangladesh shrimp. The ban created significant impact on a decline in shrimp exports and the foreign exchange earnings. The other consequences of the ban were also impact on the existence of processing plants as well as the rose of unemployment in this industry. Thus, it can be seen that the complexity of the shrimp supply chain and improper supply chain risk approach could produce significant loss in this sector.

5. Conclusion

Shrimp industry has an important role for the district of Sidoarjo in terms of their contribution for economic. As this industry has several entities and complex supply chain, all entities should have knowledge in supply chain risk management. The ability of all entities in shrimp supply chain to apply supply chain risk management can help them to sustain their business. However, there are fewer investigations related to supply chain risk management in this sector. Therefore, this paper identifies the framework of supply chain risk management from other sector to present in the final research model. This will be investigated in the future research.

The research is important for both academics and business professionals. The academicians can identify several frameworks in supply chain risk management and indicate how these can be effectively measured before and during mud volcano disaster. In addition, business professionals can recognize in how the entities in shrimp supply chain applied their supply chain risk before and during the mud volcano disaster. This will give the business professionals knowledge in managing the supply chain risk in shrimp industry as well as its impact on their business performance. Identifying the role of supply chain risk management before and during natural disaster will enable entities, such as, farmers, depots, transporters, processing plants, and exporters, to prevent their business from huge loss in the current and future time.

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